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P A P E R S

I N

M E C H A N I C K S.



M E C H A N I C K S.

IN the former Volumes of these Transactions, several accounts have been given of the invention of the Gun-Harpoon, and of the Rewards bestowed by the Society to promote the use of it. This year the following Letters and Claims having been received, Premiums of Two GUINEAS each were adjudged to JOHN MITCALF and CHARLES FOX, Harpooners, agreeably to the advertisement published by the Society in 1788. And as, by the Letters of the Captains WHEATLEY, it appears that three Whales were killed by the Gun-Harpoon in 1785, four in 1786, and three in 1787, the Society, as an inducement to the more general use of the Gun-Harpoon, voted a Bounty of ONE GUINEA for each Whale mentioned in those Letters; the money to be distributed to the Harpooners, in proportion to the number of Whales killed by each of them.

GENTLEMEN,

GENTLEMEN,

BEING lately informed it is your desire to encourage the use of the Gun-Harpoon in killing whales, I am induced to lay before you, for your consideration, two instances which occurred last season, in the ship *Queen Charlotte*, of London, under my command, in Davis's Straits,

June 11, 1787, Thomas Stinton, harpooner, struck a fish at the distance of seventy-two feet, or thereabout; there not being the least view of striking with the Hand-Harpoon, as the fish, to all appearance, was going down; run out three lines and a quarter, and was killed in two hours; at this time the line was fixed to the harpoon, by a wire shackle, laid in the manner of a rope.

June 25, 1787, James Brown, harpooner, struck a fish at the distance of

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eighty-feet, or thereabout, there not being the least view of striking with the hand-harpoon, as the fish was, to all appearance, going down, ran out two lines and a half; was killed in one hour and a half: at this time the line was fixed by a strop, made of foreganger, our wire-shackles being all broke by often firing; which last inconveniency I have found in a great measure removed, by fixing a piece of cork in the slit of the but-end of the harpoon, to soften the first shock of the wire, sliding from one end of the harpoon to the other.

I am, GENTLEMEN,

Your most obedient

humble servant,

JAMES WHEATLEY.

Shakespear-Walk, Shadwell,

February 13, 1788.

To the Society for the Encourage-
ment of Arts, Manufactures, and
Commerce.

N GENTLEMEN,

GENTLEMEN,

I HAVE been informed lately of the encouragement given by you for the use of the Harpoon-Guns, in the Whale-Fishery. I beg leave to lay before you the following instance of their utility, in the *Britannia*, belonging to Mr. John Thompson, of London, under my command, during the three last seasons, in Davis's Straits; in which time we killed fourteen large whales, and in all of which the guns have been the principal instruments of their destruction: eight of which were first struck by the gun-harpoon; and the others, although not the first, were generally the second and third: and often when a boat, with the common harpoon, dare not approach them, by reason of their throwing about their fins and tails, the gun, at a safe distance of eight, twelve, or fifteen fathoms,

has

has given them their mortal wound. Our two guns are made by Staghold of Stratford.

The greatest inconvenience we laboured under was the rain or snow, and sometimes the sea wetting the lock : to remove that obstacle, I had a case of leather, lined with tin, to fit round the gun, and over the lock, big enough to fire the gun with the case on ; so that we could fire in any weather : and found thimbles made of wire, twisted in the slit of the harpoon, and a bit of cork in the upper end of the harpoon, to answer the purpose very safely and well.

Their uses in calm and still weather are very great ; as a whale, although it is a timorous creature, will very often let a boat approach it to twenty, fifteen, and even ten fathoms, before it sinks ; all of which distances are in the reach of the gun, but none of them in the reach of the hand-harpoon.

180 M E C H A N I C K S.

July 9, 1785, George Leslie shot, with the harpoon-gun, a whale, near ten feet bone, at about ten fathoms distance; the harpoon carried the line four feet into the body: it went down about fifteen minutes; came up blowing blood, and was killed on the spot.

July 10, 1785, Henry Allison shot a fish of eleven feet bone, at fifteen fathoms distance; which was killed in a very short time: the weather was calm, and the fish going down.

July 12, 1785, Henry Allison shot a large fish, thirteen feet ten inches bone, at four fathoms distance: it lay almost without life, or motion, for some minutes: struck in four harpoons and six lines; when it went down, and died at the bottom.

May 6, 1786, James Hagan (since dead) shot a fish of about ten feet bone, at fourteen fathoms distance: it ran out three
lines

M E C H A N I C K S. 181

lines, and was killed in half an hour. It was calm; and no other chance of getting it but by the gun.

May 6, 1786, George Leslie shot a fish of eleven feet bone, at eight fathoms distance, through the tail; when none of our boats durst go nearer: it carried the line through the tail five fathoms, broke the harpoon in the flit. The fish rolled so much as to twist the line together like a rope; and did not draw back, though it ran out six lines, and was eight hours in killing. I have not heard of any instance of a fish being struck over the feathers, in that part, so as to get it, the above excepted.

May 21, 1786, Benjamin Brown shot a fish, close to the boat: the harpoon carried six feet of line into the body with it. Blowed blood like a torrent; and was killed in ten minutes.

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May 22, 1786, Henry Allison shot a whale of twelve feet bone, at ten fathoms distance. It was calm, and the fish going down : it ran out four lines, and was killed in an hour.

April 28, 1787, Michael Matthews shot a fish, about twelve fathoms distance. It was calm, and the fish going down. There was another ship's boat, two fathoms nearer ; but they could not reach it with a hand-harpoon : and we killed it in an hour.

I am, GENTLEMEN,

Your most obedient humble servant,

JOHN WHEATLEY.

*Shakespeare-Walk, Shadwell,
February 1, 1788.*

To the Society for the Encourage-
ment of Arts, Manufactures and
Commerce.

GENTLEMEN,

MECHANICKS. 183

GENTLEMEN,

I AM informed you have offered a Premium, as an encouragement for the use of the Harpoon-Gun, on the Whale-Fishery. I beg leave to certify to you the under-mentioned instance, this last season, in the Blenheim, of London, under my command, in behalf and for the use of the Harpooner, as an inducement for others to follow his example.

Francis Mitcalf, harpooner, of the ship Blenheim, on the 14th of June, at 7 P. M. being nine or ten fathoms distant from a whale fish, and finding her going down, fired the gun-harpoon (made by Mr. Moore), and got fast to her; and she did

N 4

not

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not run twenty fathoms of line out, before the boats killed her.

Given under my hand, this 22d of December, 1788.

JOHN MITCALF.

Fox's Lane, Shadwell.

To the Society for the Encouragement of Arts, Manufactures, and Commerce.

GENTLEMEN,

MECHANICKS. 185

GENTLEMEN,

I AM informed you have offered a Premium, as an encouragement for the use of the Harpoon-Guns, on the Whale-Fishery. I beg leave to certify to you the under-mentioned instance, this last season, at Davis's Straits, in the ship Simond, of Ipswich, under my command, in behalf and for the use of the Harpooner; as an inducement for others to follow his example.

Charles Fox, harpooner, of the said ship Simond, on the 16th of June, 1788, at meridian, being about ten or twelve fathoms distant from a whale fish, and thinking her going down, fired the gun-harpoon (made by Mr. Moore) over the starboard bow of the boat, and got fast to her; and she ran out about two lines and
a half;

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a half; when two harpoons more were struck into her; at which time the first, or gun-harpoon, came out, being broke by the obstruction it met with against one of her ribs; which was also broke, and was the occasion of her being so soon killed.

Given under my hand this 22d day of December, 1788.

ROBERT GORDON.

London-Street, Ratcliff.

To the Society for the Encouragement of Arts, Manufactures, and Commerce.

EVERY

M E C H A N I C K S. 187

EVERY improvement in the manufactory of Wool, the staple commodity of this Kingdom, has been considered by the Society as highly meriting their attention; and this year the following Letters and Certificates, together with a Model of a Machine for Twitching Wool, (a work hitherto done by hand, and, from the films and dust, highly prejudicial to the persons employed in it) are received. A Plate of the Model is annexed; and the Model itself, for which a Bounty of TWELVE GUINEAS was given to Mr. HUGH HUGHES, the Inventor, is reserved in the Society's Repository for public inspection.

GENTLEMEN,

GENTLEMEN,

I HAVE received the Model I now send, from Mr. Hugh Hughes, Millwright, of Coggeshall, in the county of Essex, the inventor; who desires me to present it to your Society; hoping, on inspection, you will find it worthy of a reward; being truly authenticated from the principal Manufacturers, who have long been in want of such a machine.

I am, GENTLEMEN,

With respect,

Your obedient and humble servant,

T. REEVES.

*Holborn-Bridge,
Jan. 22, 1788.*

To the Society for the Encourage-
ment of Arts, Manufactures, and
Commerce.

S I R,

MECHANICKS. 189

S I R,

I RECEIVED your letter, dated the 8th instant; and, for answer, do inform you, that my first model of a machine for twitching of wool, was made of wood, on a two-inch scale, to find out the reverse motion (which reverse could never be effected, to any good purpose whatever, before, although it has been tried at for above thirty years past, by different persons). But that model being too large and cumbersome to send to London, I applied to a clock-maker, to make a small one, to show the said reverse motion; which was the principal thing to be known: but he did not understand making it on a proper scale; for some parts thereof he made on a quarter-inch scale, and some on a half-inch scale.

My own machine, which is now at work, is at Mr. Richard White's, baize-maker, in Great Coggeshall, Essex, whose horse-wheel

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wheel is ten feet diameter; and the next wheel, on the crank, is four feet diameter; and the wheel which drives the machine is four feet also, and drives four machines in work at once, three times backwards and forwards. It works to much greater advantage, and with more ease, than any machine hitherto discovered for this purpose; has little friction; may be worked by hand, by water, by wind, or by horse; will be found very useful for driving calenders for glazing of cloth, &c. and I hope will prove worthy of your notice: and remain,

S I R,

Your very humble servant,

HUGH HUGHES.

Coggeshall,
Feb. 12, 1788.

Mr. MORE.

S I R,

MECHANICKS. 191

S I R,

IN reply to your favour of the 7th ultimo, the machine invented by Mr. Hugh Hughes, of Coggeshall, for twitching of wool, I have used in my business for several months past; and find it to answer every purpose: therefore any favour the Society for the Encouragement of Arts, Manufactures, and Commerce, may confer upon him, I am confident he fully merits.

I am, SIR,

Your most humble servant,

RICHARD WHITE,

Coggeshall,
Nov. 11, 1788.

Mr. MORE,

WE

WE whose names are hereunto subscribed, do certify, That Hugh Hughes, of Coggeshall, in the county of Essex, Millwright, has invented a machine for Twitching of Wool; which it performs in a very expeditious and complete manner: his machine is greatly superior to any before constructed for that purpose; being found, by experience, the most useful one ever invented, for baize-makers, clothiers, and other manufacturers of wool.

October 15, 1788.

RICHARD WHITE,	}	Baize-makers, of Coggeshall, Essex.
STEPHEN UNWIN,		
JOSEPH BOTT,		

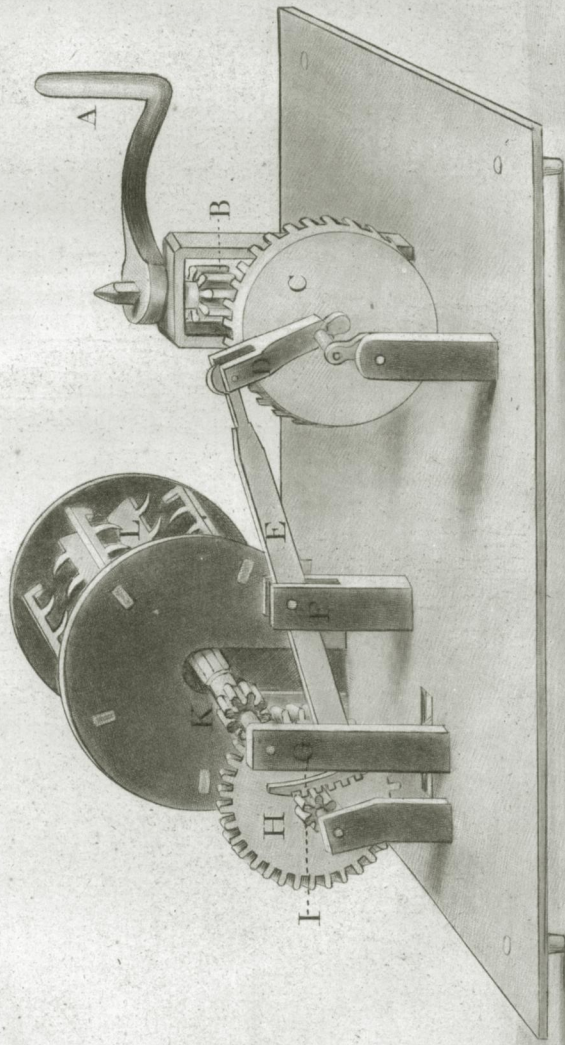
THOMAS NOTTIDGE,	}	Baize-makers, of Bocking, Essex.
JOSEPH NOTTIDGE,		

THOMAS BOGGIS,	{	Baize-maker, of Colchester, Essex.
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THOMAS STUCK,	{	Baize-maker, of Halsted, Essex,
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DESCRIPTION

Mr. Hughes's Machine for twitching Wool.



DESCRIPTION of the Plate of the
Model of Mr. HUGHES's Machine for
 TWITCHING WOOL.

A, the winch by which the pinion B is turned; this pinion taking into the teeth of the face-wheel C, on whose axis is the crank D, an alternate motion is communicated to the bar E, moving on an axis F; and thus the horse-head G drives the wheel H to the right or left, as the teeth of the horse-head take into the pinion I: and the teeth of wheel H, taking into the pinion K fixed on the axis of the twitching machine L, the fangs on the fliers are alternately driven, with considerable velocity, first one way, and then the other. In the Model, a cover is placed over the part into which the wool is put, so that it resembles a box, as is necessary in the large works, to prevent the inconveniences arising from the small particles of wool that are driven about,

O

during

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during the operation, to the great detriment of the workmen employed in the hand-machines used before this contrivance of Mr. Hughes.

It will easily be seen, by any mechanic, how this machine may be fixed to a horse-mill, water-wheel, &c.

As the word *twitching*, when applied to the preparing wool, appeared to be a local term, Mr. Hughes was desired to explain what was meant by it, and what word was made use of for the same operation in other parts of the country.

In answer to this request, the following letter was received.

S I R,

S I R,

I RECEIVED your favour ; and beg leave to acquaint you, that the use of my Machine is for opening and preparing the wool for the carders and spinners (which was formerly done by men beating it with sticks called rods). But of late the method has been to use mills, called here *Gigging-Mills*, which in Yorkshire are called *Towing-Mills*: these are worked by men turning them backward and forward, till the wool is sufficiently opened for use. The reverse motion, as shown in my Machine, was much wanted ; and the benefit and advantage of it is well known, and approved ; it having been at work almost two years.

I am

Your humble servant,

H. HUGHES.

Coggeshall, March 25, 1789.

Mr. MORE.

IT is obvious that an easy and cheap method of Repairing Roads is of singular service, in every part of the country ; and the Harrow, of which a Plate is annexed, invented by Mr. HARRIOTT for that purpose, appearing, both from its form and from the Certificate, well calculated to answer that end, the Society voted a Bounty of TEN GUINEAS to the Inventor ; and the Model is reserved in the Repository, for the inspection and use of the Public.

S I R,

SIR,

SENSIBLE as I am of the great desire the Society for the Encouragement of Arts, Manufactures, and Commerce, have for encouraging every kind of improvement, if found really useful ; I take the liberty of sending them the accompanying model of a Road-Harrow, which I directed to be made last summer ; in hopes that it will meet the approbation of the Society of Arts, &c. and, through their means, become as generally useful to others, as I have experienced it to be to the roads in this parish.

Being appointed surveyor for the roads, at Michaelmas, 1786, and finding them very bad, I provided a sufficient quantity of stones and gravel against the next summer, to cover the roads pretty thick ; but, when so done, I found the heavy loads of
O 3 chalk,

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chalk, gravel, and corn, soon turned the stones out, and made almost as deep a rut, or rake, as ever. Stubbing the quarter in, I found an endless job, as well as a great expence: I therefore contrived the Road-Harrow, of which this is a model, and by the help of which I have, during last summer, at a very trifling expence to the parish, (after the ruts were again filled up with stones) kept the roads in extraordinary good condition. A man, a boy, and two horses, will do three miles in length in one day completely, harrowing down the quarters and drawing the stones together, which, by means of the mould-boards are dropped into the rut, far better than a man can stub them in: now if a man was employed to stub, he could not do it for less than a penny per rod (the most common price is three halfpence or two pence per rod, if they stub the outside as well as the inside quarter) which would amount to one pound six shillings and eight pence for one mile in length; consequently, to four pounds for
three

three miles, which the road-harrow will do in one day ; and for which I charged the parish, for man, boy, and horses, only eight shillings.

It is not the difference in the expence only that constitutes its merit, for it does the work better as well as cheaper. In consequence of the good effect on our roads, other parishes in this neighbourhood have made, and are making the same kind of harrows for their own roads : and I am inclined to think the use of them will soon become general, so far as known, wherever they mend their roads with gravel. Should this prove so by your approving and publishing the same, you may better conceive than I can relate the pleasure I shall receive in hearing of the good effects.

The model which I have sent is on a scale of two inches to a foot ; by which you will find that the head of the harrow is three feet, from outside to outside of the

O 4 bars ;

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bars : the bars are four inches square, and the length of them five feet. You will observe that the mould-boards extend eleven inches further ; which I found necessary, in order to draw the stones (which the teeth of the harrow work up to the top) into a smaller focus, if I may so express myself. These mould-boards are four feet two inches long, ten inches deep, and two inches thick ; they are shod with a bar of iron, and lined with an iron plate, so far as they are marked black on the model : the same holds good with every other part of the model, where it is marked black ; being intended to distinguish the iron work from the wood work. The teeth (which should be steeled at the points) are one foot in length, from the under side of the bars, to their points ; they are one inch and a quarter square ; and are fixed with strong nuts and screws, with collars both on the under and upper side of the bars.

You

You will please to observe, I have made the bars go lengthways, instead of going across: this I did to prevent them from splitting; which would have been difficult to have prevented, had the teeth been fixed in cross-bars. As it is, I have found it answer the purpose intended, better than I expected: yet it is very likely it may be improved; I wish it may. Such as it is, I beg leave, through the medium of your Society, to present it to the public; for I do not like confining any thing (that may be of general use) by patents.

The harrow is drawn by two horses abreast: a boy leads the outside horse, on the outer quarter; the other horse goes in the horse-path, the man steadying the harrow by the handles: of course they take one inside and one outside quarter as they go, and the other two quarters as they come back.

Should

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Should the Honourable Society wish any further information, I shall be happy to communicate any thing in the power of

Your very humble servant,

JOHN HARRIOTT.

*Great Stambridge,
Near Rochford, Essex.*

Mr. MORE.

Great

WE whose names are hereunto subscribed, do certify, That a certain machine, called a Road-Harrow, invented by John Harriott, Esq. of Great Stambridge, in the county of Essex, for the purpose of harrowing down the quarters of the road, and gathering the stones into the ruts, was made, under his directions, for the use of the said parish; and, from the experience of its very great utility to our roads this last summer and autumn, we are certain, that it does more work in one day, with a man, a boy, and two horses, and in a much better manner, than could be effected by twenty men in the common mode of stubbing roads:

And we are of opinion, that if such road-harrow was made generally known, it would be found of infinite use to all gravelled

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velled roads, especially where quarters are formed by carriages following in one continued track.

Z. STICHALL, Curate of Great Stambridge.
CHRISTOPHER WORSHIP, Churchwarden.
WILLIAM HARPER, Surveyor.

SAMUEL WOOLF,

ALBION DICKERSON, } Servants who worked
THOMAS MEAD, } the Harrow,

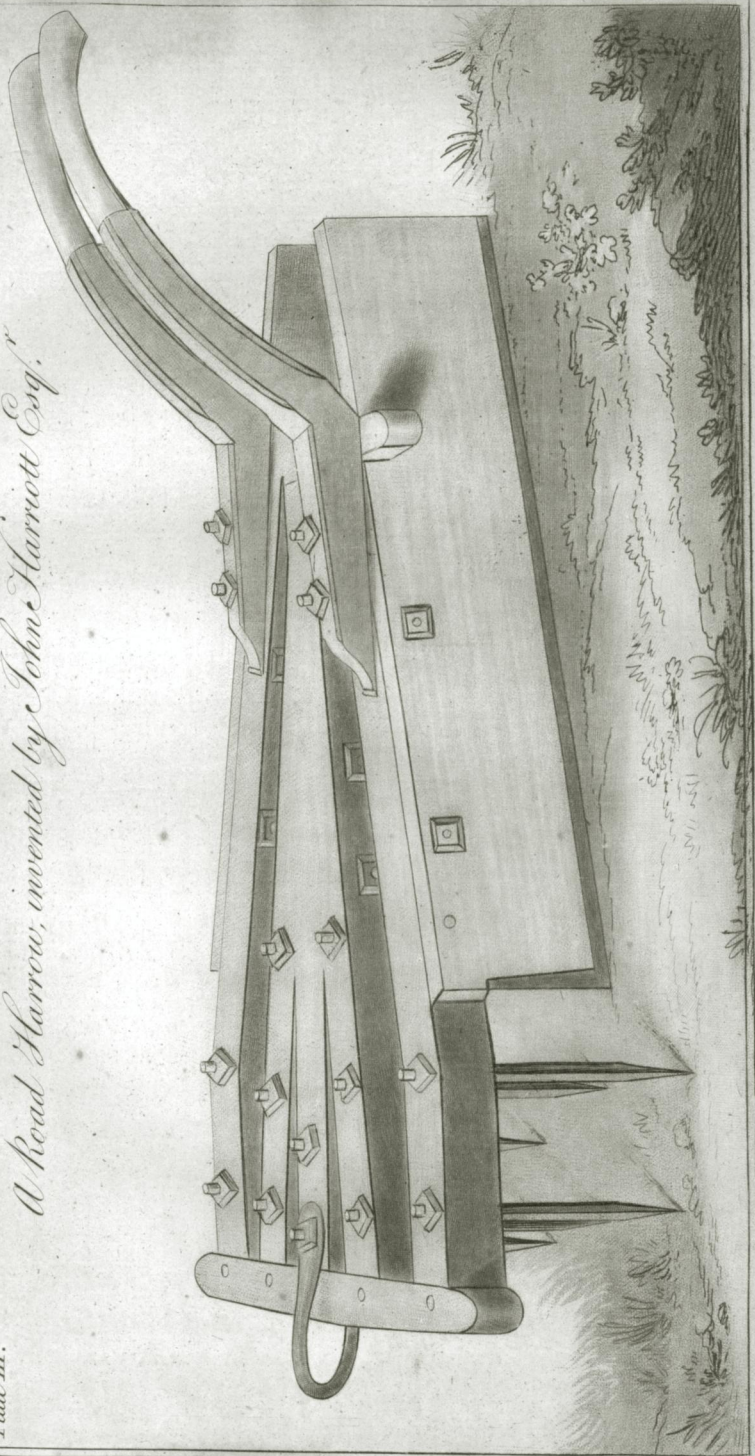
Great Stambridge,
Dec. 13, 1788.

A Print of Mr. Harriott's Road-Harrow is annexed; but the construction being very simple, and the dimensions of the several parts fully and accurately described in the foregoing Letter, a further explanation of the Plate is judged unnecessary.

THE

Plate III.

A Road Harrow, invented by John Harriott Esq.^r



THE following Papers, and annexed Plate, fully explaining a method of supplying the loss of a Ship's Rudder at sea, cannot fail of being highly acceptable to the public, when it is considered that such an accident is attended with the most distressing circumstance to all on board the vessel: and as, from the letters of Capt. PAKENHAM and Capt. CORNWALLIS, it clearly appeared, the substitute hereafter described is fully adequate to the intention proposed, the Society presented their GOLD MEDAL to Capt. PAKENHAM, the inventor, as a mark of their approbation of his ingenious and useful contrivance of a Substitute for a Rudder, the complete model of which is reserved in the Society's Repository.

S I R,

S I R,

AS many of my profession have honoured with their flattering testimony my machine for steering a ship when her Rudder is gone, I feel it a respect due to your Society, to present them with a model of it, accompanied with an explanation; persuaded that the smallest effort to obtain a practical improvement cannot fail of being highly acceptable.

The Society will be pleased to observe, Sir, that this substitute for a rudder is formed of those materials without which no ship goes to sea, and its construction simple and speedy. If, from a conviction of its being calculated to answer the end proposed, the Society should be pleased to honour the contrivance with their approbation, it will add to the satisfaction I cannot but feel in having suggested an
expedient,

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expedient, under one of the most distressing situations a ship can possibly be reduced to.

I have the honour to be, with the greatest respect,

S I R,

Your most faithful

and obedient servant,

EDWARD PAKENHAM,

*Merlin, Portsmouth,
April 29, 1788.*

Mr. MORE.

S I R,

S I R,

WHEN I was on the point of sailing from England, I had the honour to send, for the inspection of the Society, a Steering-Machine, to be used in circumstances of distress, from the loss of a Rudder: I forbore at that time entering into a particular account of it, as it has been often found that the most apparent and plausible theory could not be reduced to practice; and I was determined to make the experiment, before I should return to England again.

On the 7th of July last, in Trinity-Harbour, Newfoundland, the machine being prepared, and the Merlin's rudder unhung, the substitute was shipped with the greatest ease, and the ship got under sail: and it is now, Sir, with much satisfaction I can inform you, that, during the different manœuvres of tacking and wearing, we could

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not

not discover the least variation between the operation of the machine and that of the ship's proper rudder. She was steered, with the same ease, by one man; and answered the helm, in every situation, fully as quick.

It might probably be supposed, that a difficulty would occur in bringing the jaws of the cap to embrace the stern-post; but this will at once be obviated, when it is remembered that the top-chains, or hawfers, leading from each end of the jaws, under the ship's bottom, are, in fact, a continuance of the jaws themselves. Nor can it be apprehended that the cap, when fixed, may be impelled from its station, either by the efforts of the sea, or the course of the ship through the water, though even the hawfers, which confine it in the first instance, should be relaxed:—the experiment proves, that the partners must be first torn away, or the main-piece broken off.

Since the improved state of navigation, notwithstanding remedies have been found,

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in general, for the most disastrous accidents at sea, experience has evinced that nothing complete had been hitherto invented to supply the loss of a rudder. The first expedient within my knowledge, were cables veered astern, with tackles leading from them to the ship's quarters. This practice was superseded by the invention of the machine usually called "the Ipswich's Machine;" a drawing of which I have now the honour to inclose. The description will shew its complex and unwieldy construction; and the great improbability of vessels, in general, being found in possession of the materials which form it. Commodore Byron, in the Journal of his Voyage round the World, says that the *Tamer*, with every assistance from his own ship, was five days in constructing it. Besides, like the before-mentioned scheme, it can only operate to steer a ship large (and that but very wildly), and of course, under the circumstance of a lee-shore, defeat the most skilful exertions of a seaman. Several other expedients
have

have been adopted, which I shall not mention here, as the same defects equally appear in all.

Thus it was apparent, that ample room was left for the discovery of some more certain resource than any of the former ; and the scheme which has suggested itself to me, will, I trust, be found fully to answer the purpose intended.

The materials are such as scarcely any ship can venture to sea without ; and the construction so speedy, easy, and simple, that the capacity of the meanest sailor will at once conceive it.

I need not, from mathematical principles, show the certainty of its effect, as it is formed and managed in the same manner as a ship's common rudder : and as the common rudder is certainly, of all inventions, the best calculated for guiding a vessel through the water, it will of course follow, that, whatever substitute the nearest

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resembles that, must be best adapted to supply its loss.

I wish not, Sir, from the completion of a simple invention, to arrogate to myself superior merit in a profession which can happily boast so many great and able officers ; nevertheless it becomes the duty of every sea commander to anticipate, and provide a remedy for any possible disaster that may befall him : and I look for no greater reward in the performance of my duty, than the consciousness of having at least endeavoured to be useful to society, and the approbation of my profession.

I have the honour to be, with great respect and consideration,

S I R,

Your most obedient

humble servant,

EDWARD PAKENHAM.

*Merlin, Spithead,
January 15, 1789.*

Mr. MORE.

S I R,

S I R,

I AM this moment favoured with your obliging letter; and it affords me a particular pleasure in informing you I have just received the most convincing proof of the certainty of the success of my substitute for a rudder, by a trial it has lately had, on board his Majesty's ship Crown, of sixty-four guns, which, in passing from the eastward, lost her rudder on the Kentish Knock, and was steered to Portsmouth with the substitute, notwithstanding it blew a gale of wind most of the time: and Capt. Cornwallis (who commanded her) informs me it would have taken her to the East-Indies with ease.

The polite attention you have shown to the success of the substitute, impresses me

P 3 with

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with much esteem : and I beg you will
accept, with kindness, the assurance of
my being, with respect,

DEAR SIR,

Your most faithful

and obliged fervant,

EDWARD PAKENHAM.

Crutched-Friars,
Feb. 1. 1789.

Mr. MORE.

S I R,

S I R,

CAPTAIN Pakenham having inclosed me a letter from you, wherein you are desirous of having a Certificate from me, respecting the utility of his temporary rudder ; and which would likewise be of essential service to Capt. Pakenham ;

I do therefore certify, That, on our getting on shore, in his Majesty's ship the Crown, under my command, our rudder was unshipped, and rendered totally useless, by having all the pintles broke short off ; and, on our arrival in the Downs, we got the rudder up along-side the ship : and having the plan of Capt. Pakenham's substitute for a rudder on board, I ordered the spare cap to be fitted exactly similar to the plan ; which when done, we hung it, with great ease, and hove it close to the sternpost, by the top chains and hawsers, fixed to the

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eye-bolts of the cap, and brought in forward. We found it answer extremely well: it had a very fair trial; for we were two days beating to windward, under close-reefed topfails, and sometimes a heavy sea: and I have not the least doubt, had we lost our rudder, and had been obliged to have made use of Capt. Pakenham's, it would have answered in every respect: and it is not only my own opinion, but likewise the opinion of all my officers, that it would conduct a ship to any part of the world. We made use of all the materials described in the plan. I therefore think there cannot be a doubt of the great utility of it.

I am, S I R,

Your most obedient

humble servant,

JAMES CORNWALLIS.

His Majesty's Ship Crown,
February 9, 1789.

Mr. MORE.

EXPLANATION

EXPLANATION of *the Plate of a* SUBSTITUTE *for a* RUDDER, *invented by Capt. EDWARD PAKENHAM, formed from those materials without which no ship goes to sea.*

- No. 1. A topmast inverted ; the fid-hole to ship the tiller in, and secured with hoops from the anchor stocks ; the heel forming the head of the rudder.
2. The inner half of a jibb-boom.
3. The outer half of a jibb-boom.
4. A fish : the whole of these materials well bolted together :—in a merchantman her ruff-tree.
5. A cap, with the square part cut out to fit the stern-post, and acting as a lower gudgeon, secured to the stern-post with hawfers,

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fers, leading from the bolts of the cap, under the ship's bottom, into the hawse holes, and hove well tort,

6. A plank, or, if none on board the ships, gangboards.
7. Anchor-stocks, made to fit the topmast as partners, secured to the deck, and supplying the place of the upper gudgeon ; and in a merchant-ship the clamps of her windles.
8. A stern-post.
9. Hoops from the anchor-stocks.
10. Pigs of ballast, to sink the lower part.

The head of the rudder to pass through as many decks as you wish.

Plate IV.

Substitute for a Rudder.

by Captain Edward Pakenham.

